

August 19, 1977

**A STUDY OF THE DECAY OF AZINPHOSMETHYL
(GUTHION) ON THE FOLIAGE OF PEACH TREES IN
STANISLAUS COUNTY, CALIFORNIA
JUNE - JULY 1977**

by

**Keith T. Maddy, Staff Toxicologist; Charles Kahn,
Agricultural Inspector; Susan Edmiston, Agricultural
Inspector; Terry Jackson, Agricultural Chemist;
Lilia Rivera, Agricultural Chemist**

**Agricultural Chemicals and Feed
California Department of Food and Agriculture
1220 N Street, Sacramento, California 95814**

INTRODUCTION

Azinphosmethyl is a toxicity category one organophosphate insecticide. Toxic symptoms are due to blood and tissue cholinesterase inhibition. This chemical has an oral LD₅₀ (rat) of 13 ppm and a dermal LD₅₀ of 220 ppm. In California, a number of pesticide illnesses each year are reported as due to Guthion, which is the commonly available form of azinphosmethyl in California. This study was conducted to evaluate the level of residues that field workers might be exposed to on specific days after application of this pesticide. Occasional field worker poisoning incidents in the past have been attributed to contact with leaves treated with this pesticide.

Azinphosmethyl is registered for use on a wide variety of fruit, vegetable, nut, and field crops to control many insect pests. The total amount of Guthion used in 1976 was more than 336,161 pounds on 340,587 acres. In 1976, its major use was controlling insects on peaches, tomatoes, pears, and alfalfa, using 74,575 pounds on 50,523 acres of peach orchards.

Azinphosmethyl is usually marketed as a wettable powder and as an emulsifiable liquid. The formulation used in this study was Guthion 2S (Chemagro, E.P.A. registration number 3125-123 ZB). A copy of the label has been included in this report. This product has a preharvest interval of 21 days and a California worker reentry interval of 14 days.

APPLICATION

The application was made at the following rate:

Guthion - 5 pts/acre (1-1/4 lbs. actual azinophosmethyl/acre)
Sulfur - 20 lbs/acre
Water - 50 gal/acre

The application was made by a concentrate ground spray rig on June 5, 1977.

SAMPLING

Duplicate samples were collected along one row of trees at intervals of 12 hours and 40 hours, 9, 16, 23, and 30 days. Each sample consisted of 100 leaf discs 2.5 cm. in diameter. One leaf disc was taken at the four corners of twenty-five trees. One sample was analyzed for surface residues while the other was tested for total residue.

ANALYTICAL METHODS (EXTRACTION)

The procedure used for the extraction of dislodgeable, penetrated, and total residues from leaf punches was originally published by Gunther in "The Bulletin of Environmental Contamination and Toxicology," 9, 243-249, 1973. It has been documented several times in detail, with modifications that were made to accomodate the various pesticides and their metabolites that the Worker Health and Safety Unit has been concerned with.

The sample container and leaf punches are weighed and the gross weight recorded.

Total Residues

1. The leaf punches are transferred to a blending jar. The empty sample container is again weighed and the net weight of the punches recorded.
2. Approximately 50 gms of sodium sulfate and 100 mls of CHCl_3 are added.
3. The sample is blended at high speed for 3 minutes, keeping the blender cup cool by immersing it in a container of cool water. The blender cup is removed and the sample allowed to settle.
4. An aliquot is decanted into a teflon-capped bottle and stored in the freezer prior to cleanup and analysis.

Dislodgeable Residues

1. Fifty mls of water and approximately 4 drops of Sur-Ten solution (1:50) are added to the sample containers. The containers are capped,

placed in a multi-purpose rotator and rotated at 30 cycles/min for 60 min. The aqueous solution is decanted through a glass wool plug into a 500 ml separatory funnel.

2. The punches are rotated a second time, using 50 mls of water and 4 drops of Sur-Ten solution, for 30 min. This is added to the first extraction.
3. The sample is then hand-shaken for approximately 10 seconds with 30 mls of water. The container is drained into the separatory funnel with the first two extractions.
4. The aqueous solution is extracted three times with 50 ml of ethyl acetate. Roll separatory funnel 1-1/2-2 minutes. Shaking will cause emulsions. The solvent is filtered through sodium sulfate into a glass-stoppered mixing cylinder. An aliquot is decanted into a teflon-capped bottle and stored in the freezer prior to cleanup and analysis.

ANALYTICAL METHODS (CHROMATOGRAPHY)

GLC conditions:

Varian 2100, FPD detector, std. flows, 26" x 2 mm I.D. of 3% OV-17 (carbowax vapor - deposition treated) at 220° C, 26° flow.

Retention times:

Guthion	5 minutes
Guthoxone	4 minutes (100 ng = 50% deflection)

RESULTS

The daily temperature and rainfall are recorded on Table 1. The average daily maximum and minimum temperatures were 91.0 and 59.8° F, respectively. No rainfall was recorded during this study.

The results of the analysis are recorded on Table 2 and Figures 1 and 2. The field was sprayed again after the 30th day, so the study could not be followed to completion. There were still 63 ppm on the leaf surface and 77 ppm total residue in the leaf after 30 days. Further study of this material is indicated.

TABLE 1

Daily Temperature and Rainfall in Stanislaus County

Date (1977)	Temperature (°F)		Precipitation (inches)
	Maximum	Minimum	
6/5	100	65	
6	102	68	
7	98	72	
8	92	63	
9	75	59	
10	75	55	
11	84	52	
12	82	53	
13	76	53	
14	83	52	
15	88	52	
16	91	55	
17	81	55	
18	80	54	
19	87	55	
20	89	56	
21	99	63	
22	105	67	
23	98	63	
24	104	64	
25	102	66	
26	96	65	
27	96	62	
28	98	66	
29	97	66	
30	98	62	
7/1	96	66	
2	89	62	
3	87	58	
4	83	54	
5	89	51	
Average	91.0	59.8	Total 0.00

TABLE 2

Guthion Residues on the Foliage of
Peach Trees in Stanislaus County

Sample Date (1977)	Sample Interval	Surface Guthion (ppm)	Total Guthion (ppm)
5/25	Presample	--	--
6/6	12 hours	328.8	276.3
6/7	40 hours	243.3	258.2
6/14	9 days	97.4	230.0
6/21	16 days	100.0	150
6/28	23 days	84.9	138.1
7/5	30 days	63.7	77.1

FIGURE 1: GUTHION RESIDUE ON FOLIAGE OF PEACH TREES
STANISLAUS COUNTY, JUNE 1977

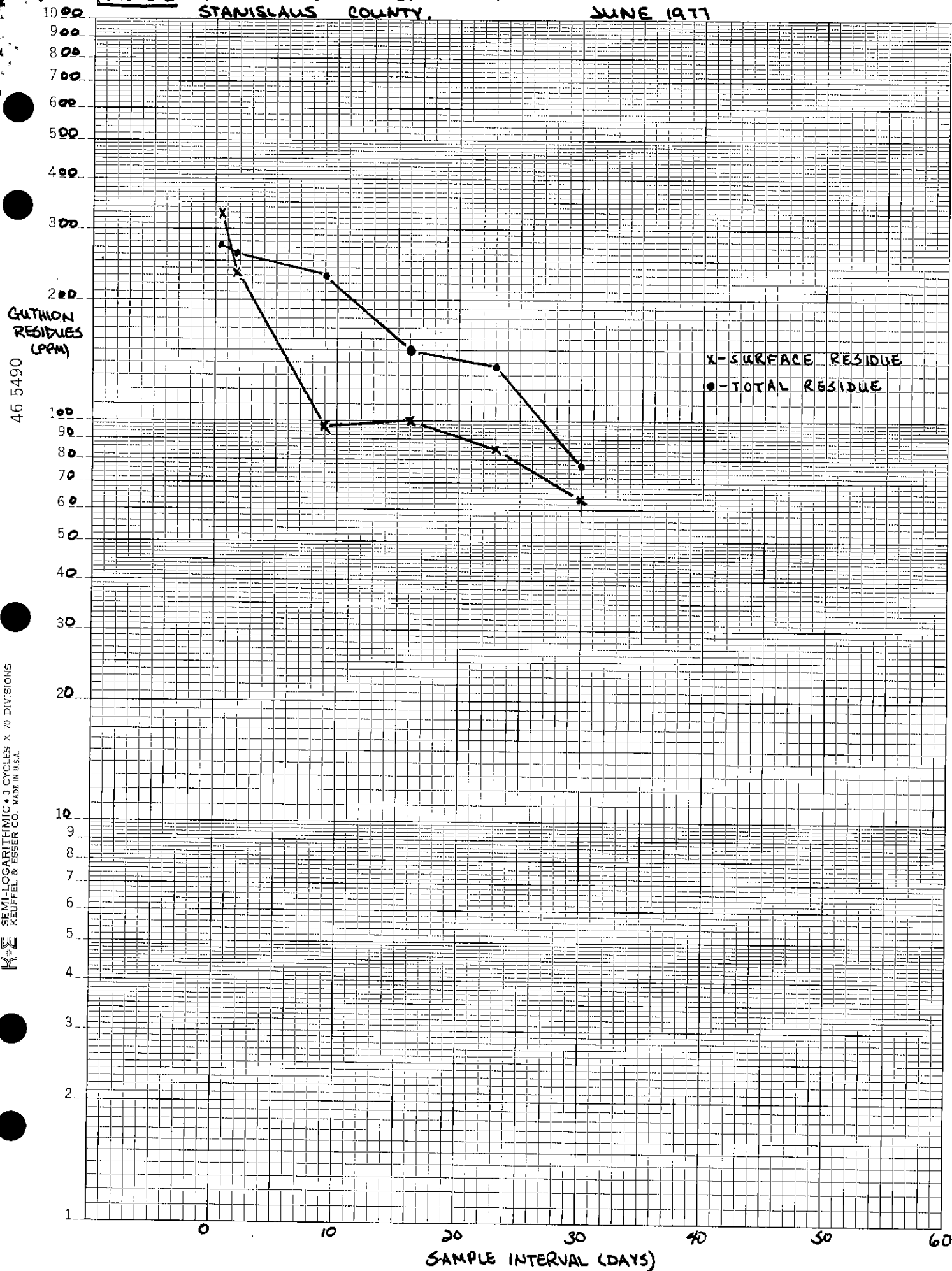
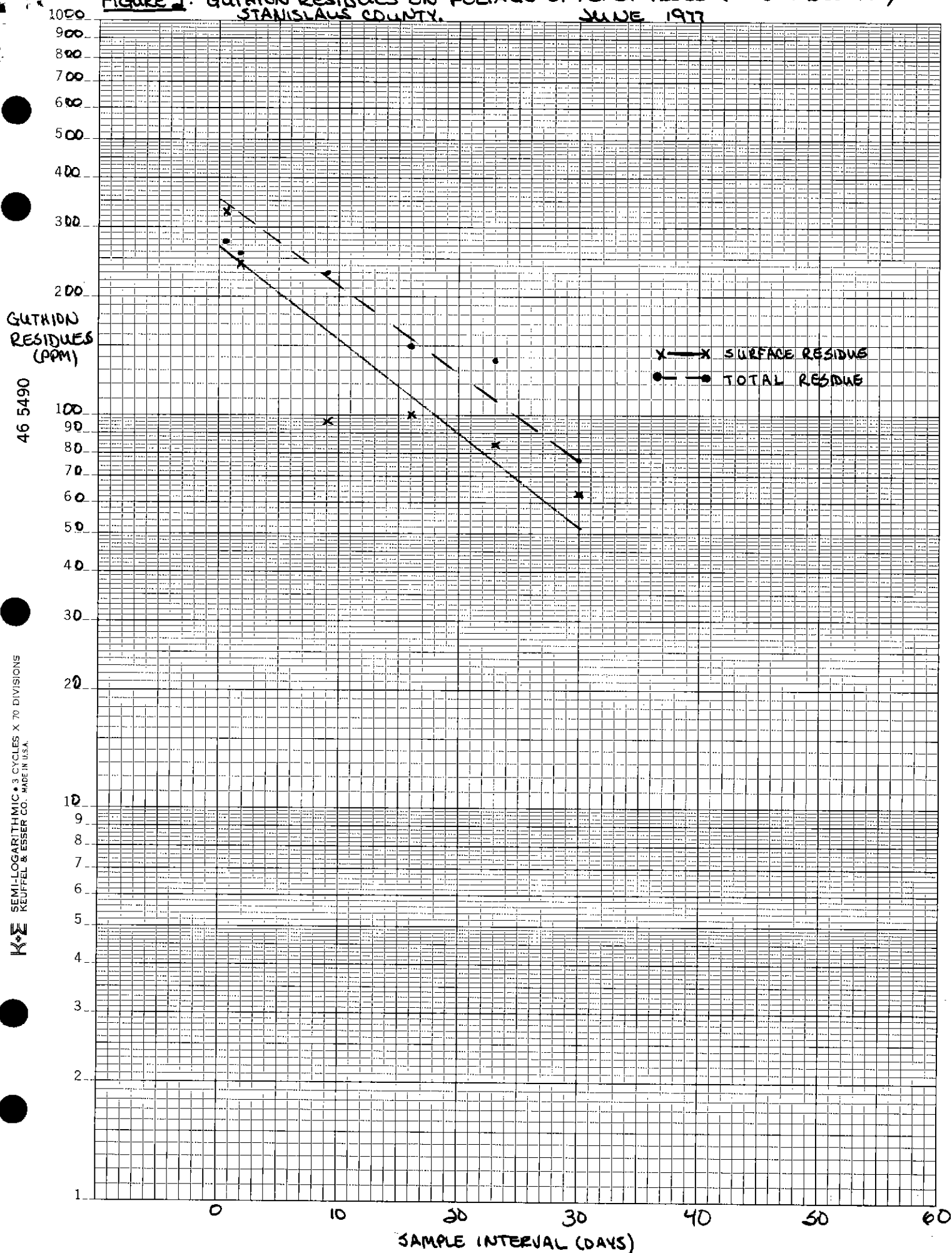


FIGURE 2: GUTHION RESIDUES ON FOLIAGE OF PEACH TREES (LINE OF BEST FIT)
STANISLAUS COUNTY. JUNE 1977



C-483216

Base Reg. (2240)

U.S. LABEL

Reason to Issue: To revise "RESTRICTIONS"
and corporate designation.

Date of Draft: 10/17/74(S)

Supersedes Draft Dated: 11/27/73

EPA Reg. No. 3125-123-ZA

(R)

GUTHION 2S

EMULSIFIABLE INSECTICIDE

ZB

FOR EFFECTIVE ECONOMICAL INSECT
CONTROL

GUARANTEE: Contains 2 lbs.
O,O-Dimethyl S-[(4-oxo-1,2,3
-benzotriazin-3(4H)-yl)methyl]
phosphorodithioate per gallon.

NET CONTENTS _____ GALLONS

~~POISON~~

DANGER

KEEP OUT OF REACH OF CHILDREN

(See rear panel for antidote
and danger statements)

ACTIVE INGREDIENTS:

O,O-Dimethyl S-[(4-oxo-1,2,3-benzo-
triazin-3(4H)-yl)methyl] phosphoro-
dithioate + 22%
Aromatic Petroleum Distillate .. 54%

INERT INGREDIENTS: 24%
100%

+Canadian Patent No. 552,660

EPA Reg. No. 3125-123-ZB

DO NOT STORE BELOW 25° F. PROTECT
FROM HEAT

KEEP AWAY FROM OPEN FLAME

DO NOT HEAT

POP - READ THE LABEL BEFORE USE

MANUFACTURED BY

CHEMAGRO AGRICULTURAL DIVISION
MOBAY CHEMICAL CORPORATION

Box 4913, Kansas City, Mo. 64120

Note: Underlined letters in chemical nomenclature should be italicized when printed,
not underlined.

DIRECTIONS FOR USE

IMPORTANT: Read these entire Directions and Conditions of Sale, including the Warranty and Limitation of Damages provision, before using GUTHION 2S emulsifiable insecticide.

CONDITIONS OF SALE: These Directions for Use reflect the opinion of experts based on tests of effectiveness, of toxicity to plants and laboratory animals and of residues on or in food and feed under normal conditions of use. However, because of the wide range of conditions under which this product may be used, even though label directions are followed, it is impossible to eliminate all risks associated with its use because of abnormal conditions beyond the control of the seller. Chemagro and the Seller offer, and the Buyer uses, this product subject to the understanding that the Buyer assumes all such risks.

MIXING: GUTHION 2S emulsifiable insecticide forms an emulsion when diluted with water and is suitable for use in all power-operated ground sprayers and aircraft sprayers. To mix with water, pour the required amount of GUTHION 2S into full amount of water and then agitate. If cold water is to be used and nozzle or screen plugging is experienced, 16 mesh slotted screens (from Spraying Systems Co.) are recommended.

DOSAGE: Use specified dosage of GUTHION 2S in the amount of water necessary to give complete coverage of foliage. The type of equipment used will determine the concentration required.

SPRAYING: Work to windward. Protect sprayer operators from drift or mist. When low volumes of spray are applied, complete coverage and thorough application are essential for most effective results. Schedule applications in accordance with local conditions. Consult your State Agricultural Experiment Station or Extension Service for specific use information in your area.

RECOMMENDED APPLICATIONS

CROP	INSECT	Pints GUTHION 2S	REMARKS
FIELD CROPS			
Alfalfa Clover	Alfalfa weevil	1 to 3	Apply specified dosage per acre using a minimum of 10 gallons of water per acre when applying with ground equipment, and a minimum of 5 gallons per acre for aerial applications for alfalfa weevils and at least 1 gallon per acre for the other insects listed. It may be necessary to use 20 to 25 gallons of water per acre on heavy growth for control of alfalfa weevil or Egyptian alfalfa weevil with ground equipment. (REMARKS CONTINUED ON PAGE 3.)
	Leafhoppers Mites	1 to 2	
	Egyptian alfalfa weevil	1 1/2 to 3	
	Alfalfa plant bug Fleahopper Grasshoppers Lygus bugs Spittlebug	2 to 3	

RECOMMENDED APPLICATIONS
(Continued)

CROP	INSECT	Pints GUTHION 2S	REMARKS
FIELD CROPS (Cont'd)			(CONTINUED FROM PAGE 2)
Alfalfa Clover	Alfalfa weevil	1 to 3	Apply twice per cutting at the 1 pint rate at intervals of 10 to 11 days. Do not apply more than twice per cutting at the 1 pint rate. Apply only once per cutting at rates above 1 pint per acre. Do not apply within 14 days of harvest at the rates of 1 to 1 1/2 pints per acre or within 16 days at the rate of 2 pints per acre. Do not apply rates above 2 pints per acre within 21 days of harvest.
	Leafhoppers	1 to 2	
	Mites		
	Egyptian alfalfa weevil	1 1/2 to 3	
	Alfalfa plant bug Fleahopper Grasshoppers Lygus bugs Spittlebug	2 to 3	
Cotton	Aphids Boll weevil Brown cotton leafworm Cotton fleahopper Cotton leafworm Lygus bugs Mites Thrips	1	Apply specified dosage per acre by air or ground equipment in sufficient water for complete coverage but not less than 1 gallon per acre. For early-season control of bollworm and pink bollworm use 2 to 3 pints and for mid-to-late season applications, use 3 to 4 pints. Repeat as necessary. Do not apply within 1 day of picking. Cotton receiving late-season applications should not be pastured and gin trash from this cotton should not be fed.
	Rapid plant bug Tarnished plant bug	1 to 2	
	Stink bug	2	
	Bollworm Pink bollworm	2 to 4	
Cotton (Ultra Low Volume Spray)	(1) Boll weevil	1/2 to 1	GUTHION 2S may be used undiluted in any ground or aerial spray equipment that has been adapted and calibrated for ultra-low volume spraying. Spray machines must be equipped with accepted low volume devices that will produce droplets within the range of 30 to 100 microns in size. ULV aerial applications should be made at altitudes of 10 to 20 feet. Repeat applications as necessary but not within 2 days of hand picking. Cotton may be machine harvested anytime after application. Do not graze livestock in treated areas. Do not feed gin trash to livestock. <u>Early and Mid-season control:</u> Apply specified dosage per acre in accordance with local recommendations.
		1	<u>Diapause Weevil Control:</u> The one pint per acre rate only is recommended for control of diapausing boll weevils. Schedule applications in accordance with local recommendations.

RECOMMENDED APPLICATIONS
(Continued)

CROP		INSECT	Pints GUTHION 2S	REMARKS
FIELD CROPS (Cont'd)				
Barley Oats Rye Wheat	Cereal leaf beetle		1 1/2 to 2	Apply specified dosage per acre by air or ground equipment in sufficient water for complete coverage but not less than 1 gallon per acre. Do not apply more than once per season. Do not harvest for food, feed, forage or graze within 30 days of treatment.
Soy-beans	Aphids Bean leaf beetle Green cloverworm Leafhoppers Leaf miners Leaf rollers Stink bugs Velvet bean caterpillar		1 1/2 to 2	Apply specified dosage per acre by air or ground equipment in sufficient water to give complete coverage but not less than 1 gallon per acre. Repeat as necessary. Do not apply within 45 days of harvest. Do not graze or feed treated vines to livestock.
	Mexican bean beetle		2 to 3	
Tobacco	Aphids Grasshoppers Tobacco hornworm Tobacco flea beetle		2 to 3	Apply specified dosage per acre by air or ground equipment in sufficient water for complete coverage but not less than 1 gallon per acre. Treat hornworms as soon as egg masses or worms are first found. Repeat as necessary but not within 6 days of harvest. Prime before treating.
	Tobacco budworm		3	
FRUIT				
Apricots Nectarines Peaches	Aphids Cottony peach scale European fruit lecanium scale Forbes scale Lesser peach tree borer Mites Peach tree borer	Platynota Flavedana leaf roller Plum curculio Red-banded leaf roller San Jose scale Stink bug Tarnished plant bug Terrapin scale Walnut scale White peach scale	1 to 1 1/4	Apply specified dosage in 100 gallons of water as a full coverage spray* using not more than 800 gallons of finished spray per acre. Repeat as necessary. Do not apply more than 8 times per season, within 21 days of harvest for apricots, nectarines, and peaches, nor within 15 days of harvest for plums and prunes. Apply the 1 1/2-pint rate for oriental fruit moth or peach twig borer on apricots, nectarines and peaches only before mid-season. For control of peach tree borer, apply 2 or 3 sprays to trunk from ground to scaffold limbs, timed with moth flight. For scale control, apply when crawlers are present. NOTE: It is suggested that when treating nectarines during bloom period, beekeepers should be warned well in advance to remove hives a safe distance from orchards to be treated.
	Oriental fruit moth Peach twig borer		1 to 1 1/2	
Nectarines	Thrips		1 to 1 1/4	
Plums Prunes	Aphids Eye-spotted bud moth Forbes scale Fruit tree leaf roller Lesser peach tree borer Mites Orange tortrix Peach tree borer	Peach twig borer Plum curculio Red-banded leaf roller San Jose scale Stink bug Tarnished plant bug Tussock moth	1 to 2	
	American plum borer		2	

RECOMMENDED APPLICATIONS
(Continued)

CROP	INSECT	Pints GUTHION 2S	REMARKS
FRUIT (Cont'd) Black-berries Boysen-berries Logan-berries Rasp-berries	Leafhoppers	1	Apply specified dosage per acre to foliage using approximately 200 gallons of water for good coverage. Where ground conditions dictate an air application, use specified rate in a minimum of 1 gallon of water per acre. Repeat as necessary but not within 14 days of harvest.
	Leaf rollers		
	Leaf miners	1 1/4	
	Aphids	1 1/4 to 2	
	Obscure root weevil	2	
	Raspberry crown (root) borer	4 to 8	For control of root weevils and borers prior to harvest apply specified dosage per acre to lower portion of canes and to the soil beneath the plants, using approximately 200 gallons of water. Do not apply more than twice per season. Do not make applications within 3 days of harvest at rates up to 4 pints per acre. Rates above 4 pints per acre should be applied only before fruit set or after crop is harvested.
	Obscure root weevil	2	
Blue-berries (Eastern & North Central States Only)	Blueberry maggot. Fruitworms Lecanium Scale Plum curculio	2 to 3	Apply specified dosage per acre using approximately 200 gallons of water for good coverage. Where ground conditions dictate an air application, use specified rate in a minimum of 1 gallon of water per acre. Repeat as necessary but not more than 4 times per season nor within 3 days of harvest. If multiple late season applications of dust formulations containing GUTHION are to be made for blueberry maggot control, then do not make more than two applications of GUTHION 2S per season with the last spray no later than June 15.

RECOMMENDED APPLICATIONS

(Continued)

CROP	INSECT	Pints GUTHION 2S	REMARKS
FRUIT (Cont'd)			Apply specified dosage per acre using approximately 200 gallons of water for good coverage. Where ground conditions dictate an air application, use specified rate in a minimum of 1 gallon of water per acre. Repeat as necessary. Do not apply within 21 days of harvest.
Cran-berries	Cranberry fruitworm <u>Sparganothis</u> <u>sulfureana</u>	2 to 4	
	Tipworm Fireworms	4	
Cherries	Eye-spotted bud moth Forbes scale Fruit flies Fruit tree leaf roller Lesser peach tree borer Mites Plum curculio San Jose scale	1 to 2	Apply specified dosage in 100 gallons of water as a full coverage spray* using not more than 800 gallons of finished spray per acre. Repeat as necessary. Do not apply more than 8 times per season nor within 15 days of harvest.
	Cherry leaf miner Mineola moth	1	
Citrus Fruits	Aphids Black scale Brown soft scale Chaff scale Citricola scale Citrus mealybug Citrus rust mite Citrus thrips Cottony-cushion scale European brown snail Florida red scale Fruit tree leaf rollers Fuller rose beetle Glover scale Orange tortrix Purple scale Snow scale Western tussock moth Whiteflies	1 to 1 1/2	Apply specified dosage in 100 gallons of water as a full coverage spray* using not more than 2000 gallons of finished spray per acre. A single application per year may be applied up to within 7 days of picking. Where 2 applications are required, the second spray should not be applied within 28 days of harvest. Do not apply more than twice per fruit year. Do not pick fruit or do other work involving contact with the tree, such as pruning, within 7 days of treatment.
	California red scale Texas citrus mite Yellow scale	1 1/2	

RECOMMENDED APPLICATIONS
(Continued)

CROP	INSECT	Pints GUTHION 2S	REMARKS
<u>FRUIT (Cont'd)</u>			
Grapes	Grape berry moth Grape cane girdlers Grape mealybug Leafhoppers Mites Red-banded leaf roller Thrips	1 to 2	Apply specified dosage in 100 gallons of water as a full coverage spray* using not more than 300 gallons of finished spray per acre. Repeat as necessary but not more than 3 times per season. Minimum dosage specified may be applied up to harvest. Higher rates up to 1 1/2 pints require a 10-day interval to harvest and above 1 1/2 pints a 28-day interval to harvest.
Straw-berries	Aphids Meadow spittlebug Oblique-banded leaf roller Omnivorous leaf tier Obscure root weevil Pea leaf weevil Small black (grass) weevil Strawberry leaf rollers Whitefly	2	Apply specified dosage in 200 gallons of water per acre as a full coverage spray*. Where ground conditions dictate an air application, use specified rate in a minimum of 1 gallon of water per acre. Repeat as necessary. Do not apply within 5 days of harvest.
<u>NUTS</u>			
Almonds	Peach twig borer	1 1/2 to 2	Apply specified dosage in 100 gallons of water as a full coverage spray* using not more than 500 gallons of finished spray per acre. Do not apply more than twice per season nor within 60 days of harvest. Allow 30 days between applications.
Filberts (Pacific Northwest Only)	Apple mealybug Filbert aphid Filbert leaf roller Filbertworm	1 to 3	Apply specified dosage in 100 gallons of water as a full coverage spray* using not more than 1000 gallons of finished spray per acre. Repeat as necessary. Do not apply within 30 days of harvest. Do not graze livestock in treated groves for 21 days after treatment.
Pecans	Aphids Fall webworm Hickory shuckworm Leaf miners May beetles Mites Pecan casebearer Southern green stink bug Spittlebug Twig girdlers Walnut caterpillar	1 1/2 to 2 1/4	Apply specified dosage in 100 gallons of water as a full coverage spray* using not more than 1800 gallons of finished spray per acre. Repeat as necessary. Do not apply after husks split. Where more than 22 1/2 pints of GUTHION 2S are applied per acre in a single application do not graze livestock in treated groves. Where 22 1/2 pints or less of GUTHION 2S are applied per acre livestock may be grazed in treated groves after a 21-day post-treatment interval.

RECOMMENDED APPLICATIONS
(Continued)

CROP	INSECT	Pints GUTHION 2S	REMARKS
NUTS (Cont'd)			
Walnuts	Aphids Codling moth European red mite Filbertworm	1 1/2 to 3 3/4	Apply specified dosage in 100 gallons of water as a full coverage spray* using not more than 1100 gallons of finished spray per acre. Repeat as necessary. Do not apply after husks split. Do not graze livestock in treated groves for 21 days after treatment.
VEGETABLES			
Artichokes	Plum moth	6	Apply specified dosage per acre by air or ground equipment in sufficient water for complete coverage but not less than 1 gallon per acre. Repeat as necessary. Do not apply within 30 days of harvest. Do not feed or ensile treated forage.
	Leaf rollers Mites	1 to 2	
Beans (Snap & Dried)	Aphids Bean leaf beetle Green cloverworm Leafhoppers Leaf miners Stink bugs Velvet bean caterpillar	1 1/2 to 2	Apply specified dosage per acre by air or ground equipment in sufficient water for complete coverage but not less than 1 gallon per acre. Repeat as necessary. Do not apply to snap beans within 7 days of harvest nor to dry beans within 30 days of harvest. Do not exceed 4 applications on dry beans. Do not feed or ensile treated forage.
	Mexican bean beetle Spotted cucumber beetle Striped cucumber beetle Tarnished plant bug Western-striped cucumber beetle	2	
Broccoli Brussels Sprouts Cabbage Cauliflower	Aphids Cabbage looper Diamondback moth Imported cabbageworm	2 to 3	Apply specified dosage per acre by air or ground equipment in sufficient water for complete coverage but not less than 1 gallon per acre. Repeat as necessary. Do not apply within 7 days of harvest for Brussels sprouts, 15 days of harvest for broccoli and cauliflower, nor within 21 days of harvest for cabbage.
	Cabbage maggot	1/2	Mix specified dosage in 50 gallons of water. Apply 4 to 6 ounces of this emulsion per plant immediately after transplanting.
	Cabbage maggot (Transplant Fields in California only)	3	Apply specified dosage in 300 to 400 gallons of water per acre as a soil drench in the rows when damage first appears. Additional applications may be necessary. Do not apply within 21 days of harvest.
	Cabbage maggot (Direct Seeded Fields in California only)	3	Apply specified dosage per acre in sufficient water for uniform distribution. Mix in the upper 2 inches of soil prior to seeding or spray in the seed row at planting time. Usually 2 to 3 additional sprays are necessary during the growing season depending upon time of year and maggot population. Do not apply within 21 days of harvest.

RECOMMENDED APPLICATIONS
(Continued)

ROP VEGETABLES	INSECT (Cont'd)	Pints GUTHION 2S	REMARKS
Celery	Aphids Leaf miners Leafhoppers Spittlebugs Tarnished plant bug	2	Apply specified dosage in 100 gallons of water as a full coverage spray* using not more than 200 gallons of finished spray per acre. Repeat as necessary but not within 14 days of harvest.
Blackeyed peas (Southern peas, Crowder peas)	Corn earworm Cowpea curculio	3 to 4	Apply specified dosage per acre by air or ground equipment in sufficient water for complete coverage but not less than 1 gallon per acre. Do not apply more than 4 times per season nor within 7 days of harvest. Do not use vines for feed or forage nor pasture treated areas.
	Leaf miners Stink bugs	1 1/2 to 2	
Cucumbers	Spotted cucumber beetle Striped cucumber beetle Western-striped cucumber beetle	2	Apply specified dosage per acre by air or ground equipment in sufficient water for complete coverage but not less than 1 gallon per acre. Do not apply more than 3 times per season nor within 1 day of harvest.
Eggplant	Leaf miners	1 1/2 to 2	Apply specified dosage per acre by air or ground equipment in sufficient water to give complete coverage but not less than 1 gallon per acre. Repeat as necessary. Do not apply after fruit set.
	European corn borer Flea beetles	2	
Onions (Green & Dry)	Thrips	2 to 3	Apply specified dosage per acre by air or ground equipment in sufficient water to give complete coverage but not less than 1 gallon per acre. Do not apply more than 3 times per season nor within 28 days of harvest of dry onions or 7 days of harvest of green onions.
Peppers	Leaf miners	1 1/2 to 2	Apply specified dosage per acre by air or ground equipment in sufficient water to give complete coverage but not less than 1 gallon per acre. A maximum of 4 treatments may be made up to within 3 days of harvest. Where more than 4 applications are required, do not apply last spray within 14 days of harvest.
	European corn borer Flea beetles	2	
Potatoes	Colorado potato beetle	1 1/2	Apply specified dosage per acre by air or ground equipment in sufficient water for complete coverage but not less than 1 gallon per acre. Repeat as necessary. Do not apply within 7 days of harvest.
	Banded cucumber beetle	1 1/2 to 2	
	Leaf miners		
	European corn borer Flea beetle Leafhoppers Spittlebugs Tarnished plant bug	2 to 3	
	Tubeworm	2 1/4 to 3	

RECOMMENDED APPLICATIONS
(Continued)

(continued)

CROP	INSECT	Pints GUTHION 2S	REMARKS
VEGETABLES	(Cont'd)		
Spinach	Aphids Leaf miners Mites	1 1/2 to 2	Apply specified dosage per acre by air or ground equipment in sufficient water for complete coverage but not less than 1 gallon per acre. Repeat as necessary. Do not apply within 14 days of harvest.
Tomatoes	Colorado potato beetle	1 1/2	Apply specified dosage per acre by air or ground equipment in sufficient water for complete coverage but not less than 1 gallon per acre. Repeat as necessary. The high rates should be used where heavy infestations of late instar lepidopterous larvae (large worms) and pinworms are present. Rates of 3 pints or less per acre may be applied up to day of harvest. Rates above 3 pints per acre require an interval of 14 days between application and harvest.
	Banded cucumber beetle <u>Drosophila</u> Green stink bug Leaf miners Whitefly	1 1/2 to 2	
	Aphids European corn borer Flea beetles Grasshoppers Leafhoppers Thrips	2 to 3	
	Tuberworm	2 1/4 to 3	
	Corn earworm Fruitworm Hornworm Pinworm Yellow-striped armyworm	3 to 6	
MELONS			
Honeydew Melons	Leafhoppers Leaf miners	1 1/2 to 2	Apply specified dosage per acre by air or ground equipment in sufficient water to give complete coverage but not less than 1 gallon per acre. Repeat as necessary up to the day of harvest but not more than 4 times per season.
Muskmelons (Cantaloupe)	Rindworms Spotted cucumber beetle	2	
Watermelons	Striped cucumber beetle		
Other melons	Western-striped cucumber beetle		
ORNAMENTALS			
Ornamentals Nursery Plants, Forest & Shade Trees	Aphids <u>Cerococcus</u> scale Euonymus scale Juniper scale Lace bugs Leafhoppers	1 1/2 to 2	Apply specified dosage per 100 gallons of water (2 teaspoonfuls per gallon). Spray all foliage surfaces including the underside of leaves for complete coverage. For control of black pine leaf, brown soft, European elm, and Putnam scales, use 1 tablespoonful per gallon. Repeat as necessary.
	Mites Olive scale Oystershell scale <u>Pulvinaria</u> scale Thrips		
	Brown soft scale Putnam scale	4	
	European elm scale Black pine leaf scale	3 to 4	

RECOMMENDED APPLICATIONS
(Continued)

CROP	INSECT	Pints GUTHION 2S	REMARKS
ORNAMENTALS	(Cont'd)		
	Cone midge Cone moth	8 to 16	Apply specified dosage per 100 gallons of water. Time applications to coincide with moth flight when cones are open for pollination. Thorough coverage of cones is necessary for maximum control. Repeat as necessary.
Ornamentals, Nursery Plants, Forest & Shade Trees (Cont'd)	European pine shoot moth Nantucket pine tip moth	1 1/2 to 3	Apply specified dosage per acre in sufficient water for good coverage. Time applications to coincide with moth flights. For application to individual trees, use 1 tablespoonful of GUTHION 2S per gallon of water.
	Injury to hawthorn or American linden may occur under some conditions. Do not allow children or pets on treated area until material has been washed into soil and treated area is dry.		
Slash Pine	Coneworm Seedworm	6	Apply specified dosage per 100 gallons of water. Thorough coverage of cones is necessary for maximum control. Repeat as necessary.

*This concentration is calculated for conventional hydraulic-type sprayers. When lower volumes of spray are applied per acre with concentrate sprayers, increase the concentration of GUTHION 2S in the spray mixture in order to apply amount of GUTHION 2S per acre equivalent to a full coverage spray. Where conditions dictate an air application, apply dosage per acre equivalent to a full coverage ground spray in not less than one gallon of water per acre.

(1)

NOTE: This formulation, when used undiluted, may cause spotting of automobile finished if prolonged exposure is permitted. Do not spray directly over automobiles. If accidental exposure does occur, automobiles should be washed immediately.

RESTRICTIONS

Do not use on other crops used for food or forage. Use only according to label directions. Application at rates above those shown may result in illegal crop residues. Do not graze livestock in treated orchards or groves for 21 days after treatment. Do not treat food crops grown in the greenhouse. Do not apply when weather conditions favor drift from areas treated.

Since certain States may require specific worker re-entry periods for various crops treated with GUTHION, or re-entry periods different than those noted on this label, consult your State Regulations of your State Department of Agriculture for information.